



226424

January 7, 2003

Bernie,

Some notes on this data.

- Your Marinelli's did not fit on NAREL's spectrometer, slightly different core diameter on the beakers. NAREL did count them nevertheless but they do not consider this valid data. See Table 1.
- NAREL repackaged the soil in their own Marinellis and counted them. See data package and Table 2.
- When the beakers were returned to me, I sifted the soil with our usual quarter inch screen, weighed the two fractions and calculated what the concentrations would have been if we had sifted the samples per our usual protocol in Streeterville. See Tables 3 and 4

Any questions, feel free to call.

Larry

1/7/03
J.I.

Verneta,
Full report
just about
done

Larry



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION AND INDOOR AIR
National Air and Radiation Environmental Laboratory
540 South Morris Avenue, Montgomery, AL 36115-2601
(334) 270-3400

December 23, 2002

MEMORANDUM

SUBJECT: Radiochemical Results for
DuSable Park Samples

FROM: John Griggs, Chief *John Griggs*
Monitoring and Analytical Services Branch

TO: Larry Jensen, Health Physicist
Region 5

Attached is a data package for gamma analysis of samples collected from the DuSable Park Site in Chicago, IL. The samples constitute NAREL batch numbers 0200060.

Radiochemical analyses usually require the subtraction of an instrument background measurement from a gross sample measurement. Both values are positive, but when the sample activity is low, random variations in the two measurements can cause the gross value to be less than the background, resulting in a measured activity less than zero. Although negative activities have no physical significance, they do have statistical significance, as for example in the evaluation of trends or the comparison of two groups of samples.

For all analyses except gamma spectroscopy, it is the policy of NAREL to report results as generated, whether positive, negative, or zero, together with the 2-sigma measurement uncertainty and a sample-specific estimate of the minimum detectable concentration (MDC). The activity, uncertainty, and MDC are given in the same units. The activity and 2-sigma uncertainty for a radionuclide measured by gamma spectroscopy are reported only if the nuclide is detected; so, the results of gamma analyses are never zero or negative. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226, and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected," or "ND," and provides a sample-specific estimate of the MDC.

Specific information concerning all aspects of the radiological analysis of the samples is contained in the batch case narrative of the data package. If you have any questions concerning the analytical results, please contact me at (334)270-3450.

Attachments

cc: Jack Barnette, Region 5, w/o attachments
Steve Ostrodka, SF, Region 5, w/o attachments
Mary Clark, (6601J), w/o attachments
Ed Sensintaffar, NAREL

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES**

REPORT OF SAMPLE DELIVERY GROUP #0200060

Project: DUSABLE PARK
Analysis Procedure: Gamma Spectrometry
Date Reported: 12/05/2002

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
A2.05326G	B-1	SAM	SOIL	10/07/2002	11/12/2002
A2.05327H	B-3	SAM	SOIL	10/07/2002	11/12/2002
A2.05328J	B-2	SAM	SOIL	10/07/2002	11/12/2002
A2.05329K	C	SAM	SOIL	10/07/2002	11/12/2002
A2.05330C	A	SAM	SOIL	10/07/2002	11/12/2002

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria except the ^{234}Th results which can be over or underestimated by gamma analysis. Please see the general information section of this data package for further explanation.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

Mary Wisdom 12/18/02
Mary F. Wisdom Date
Quality Assurance Coordinator

John Griggs 12/11/02
John Griggs, Ph.D. Date
Chief, Monitoring and Analytical Services Branch

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Reagent blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A reagent blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores." A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the Z score is computed.

Each standard uncertainty used to compute a Z score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GAMMA ANALYSIS

The reporting format lists the gamma emitters in alphabetical order. The activity and 2-sigma uncertainty for radionuclides measured by gamma spectroscopy are reported only if the nuclide is detected. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226 and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected" or "ND", and provides a sample-specific estimate of the MDC.

Due to potential spectral interferences and other possible problems associated with the determination of the activity of certain radionuclides, the activities for Th-234, Pa-234m, Ra-226, Th-231, and U-235 are subject to greater possible uncertainty than other commonly reported radionuclides. It should be noted that this potential uncertainty is not included in the two-sigma counting uncertainty which is reported with each activity. Although in this report we do provide the calculated activities for these radionuclides, we recommend that the results be used only as a qualitative means of indicating the presence of these radionuclides and not as a quantitative measure of their concentration. The results for these nuclides are not used in the evaluation of quality control samples. Furthermore, because of mutual interference between Ra-226 and U-235, NAREL's gamma analysis software tends to overestimate the amounts of these nuclides whenever both are present in a sample. Lower estimates for Ra-226 activities can be obtained from the reported activities of its decay products, Pb-214 and Bi-214, which are likely to be somewhat less than the Ra-226 activity because of the potential escape of radon gas.

NAREL's gamma spectroscopy software corrects activities and MDCs for decay between collection and analysis, but only up to a limit of ten half-lives. So, if the decay time for a sample is more than ten half-lives of a radionuclide, that nuclide will almost always be undetected and the reported MDC will be meaningless. This is usually a problem only for short-lived radionuclides, such as I-131 and Ba-140, when there is a long delay between collection and analysis.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0200060**

ANALYSIS SUMMARY

Analysis Procedure: NAREL GAM-01
Title: Gamma Spectrometry

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
A2.05326G		N/A	11/15/2002	0007275H	0002674N
A2.05327H		N/A	11/15/2002	0007275H	0002674N
A2.05328J		N/A	11/15/2002	0007275H	0002674N
A2.05329K		N/A	11/15/2002	0007275H	0002674N
A2.05330C		N/A	11/15/2002	0007275H	0002674N
A2.05330C	DUP	N/A	11/19/2002	0007275H	0002674N

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0200060**

SAMPLE ANALYSIS REPORT

Sample #:	A2.05326G	QC batch #:	0002674N
Matrix:	SOIL	Prep batch #:	0007275H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.000e+03 GWET	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: DUSABLE PARK SITE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/14/2002 15:02	1000.0	GE01	KNG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		3.5e-01	PCI/GWET	10/07/2002
Bi212	4.79e-01 \pm	1.1e-01		PCI/GWET	10/07/2002
Bi214 *	6.45e-01 \mp	4.0e-02		PCI/GWET	10/07/2002
Co60	ND		2.5e-02	PCI/GWET	10/07/2002
Cs137	ND		1.6e-02	PCI/GWET	10/07/2002
I131	ND		2.6e-01	PCI/GWET	10/07/2002
K40	7.50e+00 \pm	4.6e-01		PCI/GWET	10/07/2002
Pb212	6.00e-01 \mp	3.6e-02		PCI/GWET	10/07/2002
Pb214 *	7.20e-01 \pm	4.3e-02		PCI/GWET	10/07/2002
Ra224	6.02e-01 \mp	1.4e-01		PCI/GWET	10/07/2002
Ra226 *	1.57e+00 \pm	1.4e-01		PCI/GWET	10/07/2002
Ra228	5.15e-01 \mp	3.6e-02		PCI/GWET	10/07/2002
Th234 *	9.60e-01 \pm	8.3e-02		PCI/GWET	10/07/2002
Tl208	1.74e-01 \pm	1.3e-02		PCI/GWET	10/07/2002
U235 *	9.34e-02 \mp	8.5e-03		PCI/GWET	10/07/2002

* An asterisk indicates a result whose value may be significantly over or underestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0200060**

SAMPLE ANALYSIS REPORT

Sample #:	A2.05327H	QC batch #:	0002674N
Matrix:	SOIL	Prep batch #:	0007275H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.810e+03 GWET	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: DUSABLE PARK SITE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/14/2002 15:02	1000.0	GE02	KNG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		4.7e-01	PCI/GWET	10/07/2002
Bi212	3.12e+00 +	2.4e-01		PCI/GWET	10/07/2002
Bi214 *	7.20e-01 +	4.6e-02		PCI/GWET	10/07/2002
Co60	ND		2.2e-02	PCI/GWET	10/07/2002
Cs137	ND		2.1e-02	PCI/GWET	10/07/2002
I131	ND		4.0e-01	PCI/GWET	10/07/2002
K40	9.46e+00 +	5.8e-01		PCI/GWET	10/07/2002
Pb212	3.21e+00 +	1.8e-01		PCI/GWET	10/07/2002
Pb214 *	7.44e-01 +	4.7e-02		PCI/GWET	10/07/2002
Ra224	2.87e+00 +	2.8e-01		PCI/GWET	10/07/2002
Ra226 *	1.70e+00 +	2.3e-01		PCI/GWET	10/07/2002
Ra228	2.97e+00 +	1.7e-01		PCI/GWET	10/07/2002
Th234 *	7.34e-01 +	2.2e-01		PCI/GWET	10/07/2002
Tl208	1.10e+00 +	6.5e-02		PCI/GWET	10/07/2002

* An asterisk indicates a result whose value may be significantly over or underestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0200060**

SAMPLE ANALYSIS REPORT

Sample #:	A2.05328J	QC batch #:	0002674N
Matrix:	SOIL	Prep batch #:	0007275H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.550e+03 GWET	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: DUSABLE PARK SITE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/14/2002 15:02	1000.0	GE03	KNG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		2.7e-01	PCI/GWET	10/07/2002
Bi212	3.87e+00 ↓	2.4e-01		PCI/GWET	10/07/2002
Bi214 *	6.92e-01 ↑	4.1e-02		PCI/GWET	10/07/2002
Co60	ND		1.1e-02	PCI/GWET	10/07/2002
Cs137	ND		1.1e-02	PCI/GWET	10/07/2002
I131	ND		2.5e-01	PCI/GWET	10/07/2002
K40	6.62e+00 ↓	3.9e-01		PCI/GWET	10/07/2002
Pa234m *	6.26e-01 ×	4.0e-01		PCI/GWET	10/07/2002
Pb212	3.99e+00 ↓	2.3e-01		PCI/GWET	10/07/2002
Pb214 *	7.21e-01 ↑	4.3e-02		PCI/GWET	10/07/2002
Ra224	4.51e+00 ↑	3.1e-01		PCI/GWET	10/07/2002
Ra226 *	1.65e+00 ↑	1.9e-01		PCI/GWET	10/07/2002
Ra228	3.93e+00 ↑	2.2e-01		PCI/GWET	10/07/2002
Rn220	6.86e+00 ↓	5.0e+00		PCI/GWET	10/07/2002
Tl208	1.33e+00 ↑	7.6e-02		PCI/GWET	10/07/2002

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**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0200060**

SAMPLE ANALYSIS REPORT

Sample #:	A2.05329K	QC batch #:	0002674N
Matrix:	SOIL	Prep batch #:	0007275H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.570e+03 GWET	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: DUSABLE PARK SITE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/14/2002 15:03	1000.0	GE05	KNG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		5.5e-01	PCI/GWET	10/07/2002
Bi212	6.74e+00 \uparrow	4.2e-01		PCI/GWET	10/07/2002
Bi214	* 1.72e+00 \uparrow	1.0e-01		PCI/GWET	10/07/2002
Co60	ND		1.8e-02	PCI/GWET	10/07/2002
Cs137	ND		2.1e-02	PCI/GWET	10/07/2002
I131	ND		4.5e-01	PCI/GWET	10/07/2002
K40	6.50e+00 \uparrow	3.9e-01		PCI/GWET	10/07/2002
Pa234m	* 1.69e+00 \uparrow	7.9e-01		PCI/GWET	10/07/2002
Pb212	6.83e+00 \uparrow	3.9e-01		PCI/GWET	10/07/2002
Pb214	* 1.80e+00 ∇	1.0e-01		PCI/GWET	10/07/2002
Ra224	7.86e+00 \uparrow	5.4e-01		PCI/GWET	10/07/2002
Ra226	* 3.82e+00 \uparrow	3.7e-01		PCI/GWET	10/07/2002
Ra228	6.42e+00 \uparrow	3.7e-01		PCI/GWET	10/07/2002
Rn220	1.34e+01 ∇	9.5e+00		PCI/GWET	10/07/2002
Th234	* 1.92e+00 \uparrow	3.0e-01		PCI/GWET	10/07/2002
Tl208	2.34e+00 \uparrow	1.3e-01		PCI/GWET	10/07/2002
U235	* 2.26e-01 \downarrow	2.2e-02		PCI/GWET	10/07/2002

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**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0200060**

SAMPLE ANALYSIS REPORT

Sample #:	A2.05330C	QC batch #:	0002674N
Matrix:	SOIL	Prep batch #:	0007275H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.080e+03 GWET	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: DUSABLE PARK SITE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/14/2002 15:03	1000.0	GE11	KNG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		3.0e-01	PCI/GWET	10/07/2002
Bi212	4.29e+00 +	2.6e-01		PCI/GWET	10/07/2002
Bi214 *	1.19e+00 +	6.9e-02		PCI/GWET	10/07/2002
Co60	ND		9.5e-03	PCI/GWET	10/07/2002
Cs137	2.45e-02 +	6.5e-03		PCI/GWET	10/07/2002
I131	ND		2.7e-01	PCI/GWET	10/07/2002
K40	7.31e+00 †	4.2e-01		PCI/GWET	10/07/2002
Pa234m *	9.25e-01 †	4.3e-01		PCI/GWET	10/07/2002
Pb212	4.25e+00 +	2.4e-01		PCI/GWET	10/07/2002
Pb214 *	1.24e+00 +	7.2e-02		PCI/GWET	10/07/2002
Ra224	4.45e+00 †	3.0e-01		PCI/GWET	10/07/2002
Ra226 *	2.42e+00 †	2.2e-01		PCI/GWET	10/07/2002
Ra228	4.09e+00 †	2.3e-01		PCI/GWET	10/07/2002
Rn220	7.50e+00 †	4.7e+00		PCI/GWET	10/07/2002
Th234 *	5.95e-01 †	1.4e-01		PCI/GWET	10/07/2002
Tl208	1.43e+00 †	8.2e-02		PCI/GWET	10/07/2002
U235 *	1.39e-01 †	1.3e-02		PCI/GWET	10/07/2002

* An asterisk indicates a result whose value may be significantly over or underestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0200060**

SAMPLE ANALYSIS REPORT

Sample #:	A2.05330C	QC batch #:	0002674N
Matrix:	SOIL	Prep batch #:	0007275H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.080e+03 GWET	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	DUP

Comment: DUSABLE PARK SITE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/18/2002 14:16	1000.0	GE18	KNG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		2.8e-01	PCI/GWET	10/07/2002
Bi212	4.26e+00	2.6e-01		PCI/GWET	10/07/2002
Bi214	1.23e+00	7.1e-02		PCI/GWET	10/07/2002
Co60	ND		9.6e-03	PCI/GWET	10/07/2002
Cs137	2.62e-02	5.6e-03		PCI/GWET	10/07/2002
I131	ND		2.7e-01	PCI/GWET	10/07/2002
K40	7.56e+00	4.4e-01		PCI/GWET	10/07/2002
Pa234m	1.82e+00	4.7e-01		PCI/GWET	10/07/2002
Pb212	4.17e+00	2.4e-01		PCI/GWET	10/07/2002
Pb214	1.29e+00	7.4e-02		PCI/GWET	10/07/2002
Ra224	4.38e+00	2.9e-01		PCI/GWET	10/07/2002
Ra226	2.53e+00	2.0e-01		PCI/GWET	10/07/2002
Ra228	4.14e+00	2.4e-01		PCI/GWET	10/07/2002
Rn220	6.94e+00	3.9e+00		PCI/GWET	10/07/2002
Th228	5.40e+00	1.5e+00		PCI/GWET	10/07/2002
Th234	2.49e+00	1.8e-01		PCI/GWET	10/07/2002
Tl208	1.39e+00	7.9e-02		PCI/GWET	10/07/2002
U235	1.52e-01	1.2e-02		PCI/GWET	10/07/2002

* An asterisk indicates a result whose value may be significantly over or underestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0200060**

QC BATCH SUMMARY

QC batch #: 0002674N
Preparation procedure: N/A
Analysis procedure: NAREL GAM-01

NAREL Sample #	QC Type	Yield (%)	$\pm 2\sigma$ Uncertainty (%)	Analyst
A2.05326G		N/A		N/A
A2.05327H		N/A		N/A
A2.05328J		N/A		N/A
A2.05329K		N/A		N/A
A2.05330C		N/A		N/A
A2.05330C	DUP	N/A		N/A

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

National Air and Radiation Environmental Laboratory QC Batch Report

QC Batch #: 0002674N

Analytical Procedure: NAREL GAM-01

LABORATORY DUPLICATES (PCI/GWET)

Sample ID	Nuclide	Original $\pm 2\sigma$	Duplicate $\pm 2\sigma$	RPD	Z
A2.05330C	BA140				
A2.05330C	BI212	4.29e+00 \pm 2.6e-01	4.26e+00 \pm 2.6e-01	0.70	-0.09 OK
A2.05330C	BI214	1.19e+00 \pm 6.9e-02	1.23e+00 \pm 7.1e-02	3.31	0.41 OK
A2.05330C	CO60				
A2.05330C	CS137	2.45e-02 \pm 6.5e-03	2.62e-02 \pm 5.6e-03	6.71	0.37 OK
A2.05330C	I131				
A2.05330C	K40	7.31e+00 \pm 4.2e-01	7.56e+00 \pm 4.4e-01	3.36	0.41 OK
A2.05330C	PA234M	9.25e-01 \pm 4.3e-01	1.82e+00 \pm 4.7e-01	65.21	2.68 OK
A2.05330C	PB212	4.25e+00 \pm 2.4e-01	4.17e+00 \pm 2.4e-01	1.90	-0.23 OK
A2.05330C	PB214	1.24e+00 \pm 7.2e-02	1.29e+00 \pm 7.4e-02	3.95	0.48 OK
A2.05330C	RA224	4.45e+00 \pm 3.0e-01	4.38e+00 \pm 2.9e-01	1.59	-0.19 OK
A2.05330C	RA226	2.42e+00 \pm 2.2e-01	2.53e+00 \pm 2.0e-01	4.44	0.48 OK
A2.05330C	RA228	4.09e+00 \pm 2.3e-01	4.14e+00 \pm 2.4e-01	1.22	0.15 OK
A2.05330C	RN220	7.50e+00 \pm 4.7e+00	6.94e+00 \pm 3.9e+00	7.76	-0.18 OK
A2.05330C	TH234	5.95e-01 \pm 1.4e-01	2.49e+00 \pm 1.8e-01	122.85	11.97 HIGH
A2.05330C	TL208	1.43e+00 \pm 8.2e-02	1.39e+00 \pm 7.9e-02	2.84	-0.35 OK
A2.05330C	U235	1.39e-01 \pm 1.3e-02	1.52e-01 \pm 1.2e-02	8.93	0.96 OK

Analyst:

[Signature]

12-10-02

QA Officer:

[Signature]

12/10/02

OK. Tl-234 is "estimated".

Table 1: DuSable Park, Exploration Samples---All stones and debris less than 1 inch diameter retained

Samples analyzed at NAREL in Kerr-McGee marinellis

SAMPLE NUMBER	SITE	THORIUM DECAY SERIES (Gamma Spectrometry) (pCi/g)							URANIUM DECAY SERIES (Gamma Spectrometry) (pCi/g)					OTHER (Gamma Spectrometry) (pCi/g)				TOTAL RADIUM (pCi/g)
		Ra-228	Th-228	Ra-224	Rn-220	Pb-212	Bi-212	Tl-208	Th-234	Pa-234m	Ra-226	Pb-214	Bi-214	K-40	Cs-137	U-235	Th-231	
A2.05330G	A	4.52	3.40	5.23	8.90	4.82	4.52	1.61	1.21	0.890	2.94	1.46	1.34	7.94	0.0272	0.178		5.98
A2.05326G	B-1	0.588		0.290		0.647	0.582	0.205	0.880	0.740	1.71	0.839	0.782	9.0	0.0055	0.102		1.43
A2.05328G	B-2	4.26	3.10	5.40		4.77	4.45	1.53		1.00	1.85	0.885	0.783	6.5				5.15
A2.05327G	B-3	3.12		3.21		3.53	3.25	1.16	1.16	0.840	2.04	0.919	0.865	12.2		0.125		4.04
A2.05329G	C	6.91	8.00	9.02	9.90	7.77	7.06	2.51	2.95	2.52	4.40	2.10	1.88	7.0		0.258		9.01

Table 2: DuSable Park, Exploration Samples---All stones and debris less than 1 inch diameter retained

Samples analyzed at NAREL in NAREL marinellis

SAMPLE NUMBER	SITE	THORIUM DECAY SERIES (Gamma Spectrometry) (pCi/g)							URANIUM DECAY SERIES (Gamma Spectrometry) (pCi/g)					OTHER (Gamma Spectrometry) (pCi/g)				TOTAL RADIUM (pCi/g)
		Ra-228	Th-228	Ra-224	Rn-220	Pb-212	Bi-212	Tl-208	Th-234	Pa-234m	Ra-226	Pb-214	Bi-214	K-40	Cs-137	U-235	Th-231	
A2.05330C	A	4.09		4.45	7.50	4.25	4.29	1.43	0.595	0.925	2.42	1.24	1.19	7.31	0.0245	0.139		5.33
A2.05330C, DUP	A	4.14	5.40	4.38	6.94	4.17	4.26	1.39	2.490	1.820	2.53	1.29	1.23	7.56	0.0262	0.152		5.43
A2.05326G	B-1	0.515		0.602		0.600	0.479	0.174	0.960		1.57	0.720	0.645	7.50		0.0934		1.24
A2.05328J	B-2	3.93		4.51	6.86	3.99	3.87	1.33		0.626	1.65	0.721	0.692	6.62				4.65
A2.05327H	B-3	2.97		2.87		3.21	3.12	1.10	0.734		1.70	0.744	0.720	9.46			1.02	3.71
A2.05329K	C	6.42		7.86	13.4	6.83	6.74	2.34	1.92	1.69	3.82	1.80	1.72	6.50		0.226		8.22

Table 3: DuSable Park, Exploration Samples--Soil and stone/debris masses

Samples measured at Region 5 Central Regional Laboratory

SAMPLE NUMBER	SITE	SOIL	SOIL LESS BAGGIE MASS	DEBRIS	DEBRIS LESS BAGGIE MASS	TOTAL LESS BAGGIE MASSES
		(grams)	(grams)	(grams)	(grams)	(grams)
A2.05330C	A	1402	1392	629	619	2011
A2.05326G	B-1	1438	1428	523	513	1941
A2.05328J	B-2	1126	1116	397	387	1503
A2.05327H	B-3	1510	1500	279	269	1769
A2.05329K	C	1085	1075	449	439	1514

Table 4: DuSable Park, Exploration Samples--Table 2 Soils Sifted With 1/4 Inch Screen

Samples analyzed at NAREL in NAREL marinellis

Masses of Table 3 used to adjust activity concentrations
[e.g., For Site A, Activity * (2011/1392)]

SAMPLE NUMBER	SITE	THORIUM DECAY SERIES (Gamma Spectrometry) (pCi/g)							URANIUM DECAY SERIES (Gamma Spectrometry) (pCi/g)					OTHER (Gamma Spectrometry) (pCi/g)				TOTAL RADIUM (pCi/g)
		Ra-228	Th-228	Ra-224	Rn-220	Pb-212	Bi-212	Tl-208	Th-234	Pa-234m	Ra-226	Pb-214	Bi-214	K-40	Cs-137	U-235	Th-231	
A2.05330C	A	5.91		6.43	10.84	6.14	6.20	2.07	0.86	1.34	3.50	1.79	1.72	10.56	0.04	0.20		7.7
A2.05330C, DUP	A	5.98	7.80	6.33	10.03	6.02	6.15	2.01	3.60	2.63	3.66	1.86	1.78	10.92	0.04	0.22		7.8
A2.05326G	B-1	0.700		0.818		0.816	0.651	0.237	1.305		2.134	0.979	0.877	10.194		0.127		1.7
A2.05328J	B-2	5.29		6.07	9.24	5.37	5.21	1.79		0.84	2.22	0.97	0.93	8.92				6.3
A2.05327H	B-3	3.50		3.38		3.79	3.68	1.30	0.87		2.00	0.88	0.85	11.16				4.4
A2.05329K	C	9.04		11.07	18.87	9.62	9.49	3.30	2.70	2.38	5.38	2.54	2.42	9.15		0.32		11.6